U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE/NOAA FISHERIES

Pacific Islands Fisheries Science Center
2570 Dole St. • Honolulu, Hawaii 96822-2396
(808) 983-5300 • Fax: (808) 983-2902

CRUISE REPORT[1]

VESSEL: NOAA Ship *Oscar Elton Sette*, Cruise SE-13-02

CRUISE PERIOD: April 15, 2013 to April 29, 2013

AREA OF OPERATION: Waters off leeward (west coast) Maui (see Table 1 and Fig. 1)

TYPE OF OPERATION: Fisheries Research

ITINERARY:

15 April	Embarked Kobayashi, Domokos, Taylor, Rooney, Hoover, Copeland, Chen, Wong, Anderson, Clarke, Whitmire, Fruh, Salisbury, Moffitt and proceeded to mooring buoy X9S in Pearl Harbor. Completed CTD and attempted acoustic calibration, then departed Pearl Harbor and proceeded to Lahaina, Maui.
16 April	Anchored off Lahaina, Maui and completed CTD, partial acoustic calibration, and completed ROV testing.
17 April	Weighed anchor and repositioned off Olowalu coastline, completed AUV testing.
18 April	Proceeded to survey grids and completed 1 acoustic transect. Embarked Ebisui and Eguchi. Proceeded to Maalaea Harbor to pick up AUV parts. Completed night fishing operations from the *Sette* coupled with acoustic surveys.
19 April	Proceeded to survey grids and completed 6 acoustic transects. Deployed and recovered 3 PIFG observers (Ebisui, Eguchi, Moffitt). Completed night fishing operations from the *Sette* coupled with acoustic surveys.
20 April	Proceeded to survey grids and completed 6 acoustic transects. Deployed and recovered 3 PIFG observers (Ebisui, Eguchi, Moffitt). Proceeded to

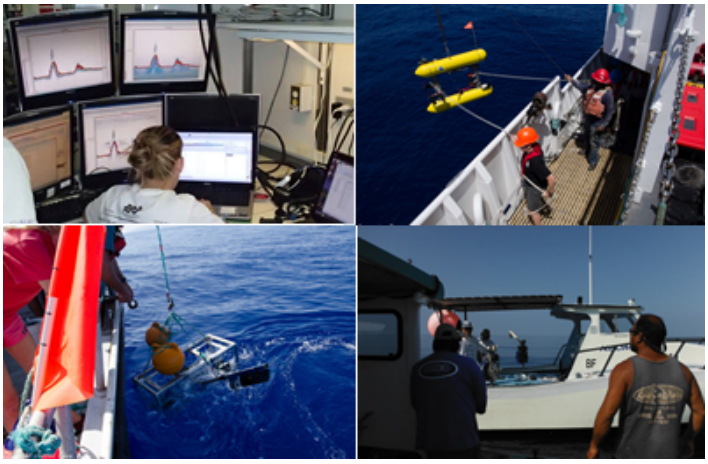
[1] PIFSC Cruise Report CR-13-001
Issued 20 August 2013

	Maalaea Harbor to pick up AUV parts. Completed night fishing operations from the *Sette* coupled with acoustic surveys.
21 April	Proceeded to survey grids and completed 4 acoustic transect. Deployed and recovered 3 PIFG observers (Ebisui, Eguchi, Moffitt). Completed a testing of ROV to bottomfish depths. Completed night fishing operations from Sette coupled with acoustic surveys.
22 April	Proceeded to survey grids and deployed and recovered 3 PIFG observers (Ebisui, Eguchi, Moffitt). Completed CTD and a drift calibration of the 38 kHz transducer. Proceeded to Maalaea Harbor to pick up AUV parts. Completed night fishing operations from Sette coupled with acoustic surveys.
23 April	Proceeded to survey grids and completed 3 acoustic transects. Deployed and recovered 3 PIFG observers (Ebisui, Eguchi, Moffitt). Deployed AUV but dive was aborted due to device reboot. Completed night fishing operations from Sette coupled with acoustic surveys.
24 April	Proceeded to survey grids and completed 2 acoustic transects. Deployed 3 PIFG observers (Ebisui, Eguchi, Moffitt). Deployed AUV succesfully. Deployed and recovered Wong and Salisbury to *Huki Pono* for the day. Completed night fishing operations from Sette coupled with acoustic surveys.
25 April	Proceeded to survey grids and completed 2 acoustic transects. Deployed AUV succesfully. Deployed and recovered Domokos, Cheng, and Copeland to *Huki Pono* for the day. Embarked Ebisui for remainder of project. Completed night fishing operations from Sette coupled with acoustic surveys.
26 April	Proceeded to survey grids and completed 2 acoustic transects. Deployed AUV succesfully. Deployed ROV succesfully. Completed night fishing operations from Sette coupled with acoustic surveys.
27 April	Proceeded to survey grids and completed 2 acoustic transects. Deployed AUV succesfully. Deployed ROV succesfully. Completed night fishing operations from Sette coupled with acoustic surveys.
28 April	Proceeded to survey grids and completed 2 acoustic transects. Deployed AUV succesfully. Deployed ROV succesfully. Departed Maui area.
29 April	Arrived Pearl Harbor fuel pier. After fueling proceeded to F9 pier Ford Island. End of project.

MISSIONS AND RESULTS:

The NOAA Ship *Oscar Elton Sette* was engaged in support for the Ecosystems and Oceanography Division (EOD) and Fisheries Research and Monitoring Division (FRMD), Pacific Islands Fisheries Science Center (PIFSC), National Marine Fisheries Service (NMFS) fisheries research programs. The principal scientific objectives of the project were to research and develop methods to cross-compare or calibrate fishery-dependent (extractive) and fishery-independent (non-extractive) sampling methodologies for use in stock assessment. The extractive and non-extractive methods included EK60 active acoustics conducted from the *Sette*, AUV camera systems deployed from the *Sette* including a BlueView imaging sonar unit, baited underwater video camera systems (BotCam) from the partner charter vessel (*Huki Pono* from Sea Engineering chartered by UH Oceanography), and hook-and-line fishing from 4 partner charter vessels (PIFG charter vessels *Hokuloa*, *Imua*, and *Naomi K*). Other research operations completed during this project include evaluation of alternative acoustic calibration methodologies (shallow-water mooring buoy, single-point anchored, and drifting in deep water); evaluation of the use of the over-the-side-pole (OTSP) for acoustic surveys to minimize bubble interference as observed using the hull-mounted transducers; and ground truthing of acoustic targets using *Sette*-based ROV and fishing operations conducted simultaneous with active acoustics. All objectives were accomplished in or near a series of 6 pairs of 500 m × 500 m survey grids located off West Maui (6 survey locations denoted A-F, with pairs 1, 2 for each of the A-F, see Table 1 and Fig. 1). These locations were chosen based on feedback from the local fishing community, prior calibration cruise surveys, climatological patterns of weather, and proximity to the small vessel port (Maalaea Harbor). The survey methods comparison was intended to be an intensive replication of survey grids to better understand within- and between-gear variability.

The SE-13-02 research project was fully successful on all objectives despite occasional challenges such as AUV mechanical issues (necessitating 3 emergency shipments of parts to Maui, with delivery facilitated by Darla White of DLNR DAR and Clayward Tam from PIFG) and placement and locating of the suspended acoustic calibration sphere below the *Sette* hull. Notably, SE-13-02 was the first calibration cruise to successfully deploy all 4 survey gears (active acoustics, AUV, BotCam, and fishing) on a single trip. The project also made significant breakthroughs in understanding the acoustic calibration process from the *Sette* and identifications of potential improvements. The OTSP has great promise for improving acoustic surveys in a wider variety of sea conditions. And lastly, during the project, there were observations of at least 2 species of fish (opelu and opakapaka) with the navigational camera aboard the ROV, and *Sette*-based fishing operations captured at least 6 species of fish (opelu, opakapaka, kalekale, ehu, taape, reef shark), both while at the same time using active acoustics on the *Sette*. These ground-truthing data points will be extremely valuable towards helping decipher species identification from the sometimes nebulous acoustic data. Although all data remain to be analyzed, it was noted preliminarily that large lehi were quite abundant in certain survey grids based on both the bottomfishing catch data and AUV optical data. In one instance a large school of mixed lehi and kahala swam in front of the AUV and was recorded on both the



stereo cameras and the BlueView sonar-imaging unit. BotCam, fishing, and acoustic data have yet to be examined for this particular occurrence.

Specifically, for the gear comparison objective SE-13-02 accomplished the following survey effort summarized by gear type (Table 2). Survey effort by the *Sette* accomplished 30 acoustic transects (Fig. 2) and 10 AUV transects (Fig. 3) covering 10 of the 12 survey grids over the 11 days of survey effort. Replication ranged from 1 to 4 acoustic transects per survey grid (average replication of 3.0 acoustic transects per survey grid), and a single AUV transect for 10 of the 12 survey grids. Survey effort by the *Huki Pono* accomplished 142 BotCam stations over the 8 contract days with replication ranging from 9 to16 BotCam stations per survey grid (average replication of 11.83 BotCam stations per survey grid) covering all 12 survey grids. Survey effort by the PIFG vessels accomplished 151 fishing stations for the 3 vessels over the 7 contract days with replication ranging from 10 to 15 fishing stations per survey grid (average replication of 12.58 fishing stations per survey grid) covering all 12 survey grids. Preliminary catch rate (CPUE) of Deep-7 species of deepwater bottomfish from the PIFG partner vessels is shown in Figure 4 for the 12 survey grids. These and other data streams will be analyzed over the coming year and evaluated in concert with results from prior and planned calibration cruises.

SCIENTIFIC PERSONNEL:

Donald Kobayashi, Chief Scientist, Pacific Islands Fisheries Science Center (PIFSC), National Marine Fisheries Service (NMFS)
Jeff Anderson, GIS Support, PIFSC, NMFS
James Barlow (*Huki Pono*), Small Vessel Coordinator and BotCam Support, PIFSC, NMFS
Jessica Chen, Acoustics Support, Hawaii Institute of Marine Biology (HIMB), University of Hawaii (UH)
Elizabeth Clarke, AUV/ROV Support, Northwest Fisheries Science Center (NWFSC), NMFS
Adrienne Copeland, Acoustics Support, HIMB, UH
Chris DeMarke (*Huki Pono*), BotCam Lead, Department of Oceanography, UH
Reka Domokos, Acoustics Lead, PIFSC, NMFS
Eddie Ebisui, Fishing Observer, Pacific Island Fisheries Group (PIFG)
Scott Eguchi, Fishing Observer, PIFG
Erica Fruh, AUV/ROV Support, NWFSC, NMFS
Aimee Hoover, Acoustics Support, PIFSC, NMFS
Robert Moffitt, Fishing Observer, PIFG
John Rooney, AUV Lead and ROV Support, PIFSC, NMFS
Rita Salisbury, Cruise Support, NOAA Teacher at Sea Program
Jeremy Taylor, ROV Lead and AUV Support, PIFSC, NMFS
Curt Whitmire, AUV/ROV Support, NWFSC, NMFS
Scott Wong, IT Lead, PIFSC, NMFS

Submitted by: _____
Donald R. Kobayashi
Chief Scientist

Approved by: _____
Samuel G. Pooley
Science Director
Pacific Islands Fisheries Science Center

Attachments: Tables 1-2, Figures 1-4.

Table 1. Location of 12 survey grids for project SE-13-02. Shaded and unshaded pairs represent adjacent 500 m × 500 m grids.

Letter ID	Grid ID	Depth (m)	Depth (fa)	Latitude	Longitude
A	1 = 16312	-123.90	-67.75	20° 45.080'	-156° 40.952'
	2 = 16416	-148.14	-81.00	20° 45.355'	-156° 41.236'
B	1 = 15853	-133.47	-72.98	20° 43.985'	-156° 40.105'
	2 = 15854	-173.96	-95.12	20° 43.981'	-156° 39.817'
C	1 = 15334	-152.09	-83.16	20° 42.890'	-156° 39.258'
	2 = 15465	-145.24	-79.42	20° 43.161'	-156° 39.254'
D	1 = 14427	-199.30	-108.98	20° 40.998'	-156° 39.575'
	2 = 14552	-228.11	-124.73	20° 41.269'	-156° 39.571'
E	1 = 14677	-290.36	-158.77	20° 41.555'	-156° 40.718'
	2 = 14678	-290.78	-159.00	20° 41.551'	-156° 40.430'
F	1 = 16097	-132.99	-72.72	20° 44.527'	-156° 40.097'
	2 = 16208	-133.19	-72.83	20° 44.798'	-156° 40.093'

Table 2. Summary of survey effort from project SE-13-02. Grids E1 and E2 were not accessible to AUV and are not included in the statistical summary for acoustics and AUV.

Grid	Acoustics	AUV	BotCam	Fishing
A1	1	1	9	12
A2	2	1	9	10
B1	4	1	11	13
B2	4	1	11	12
C1	4	1	11	14
C2	4	1	11	15
D1	3	1	12	13
D2	3	1	13	13
E1	-	-	15	15
E2	-	-	16	13
F1	2	1	13	11
F2	3	1	11	10
Total	***30***	***10***	***142***	***151***
Average	***3.00***	***1.00***	***11.83***	***12.58***
Minimum	***1***	***1***	***9***	***10***
Maximum	***4***	***1***	***16***	***15***

Figure 1. Location of 12 survey grids for project SE-13-02.

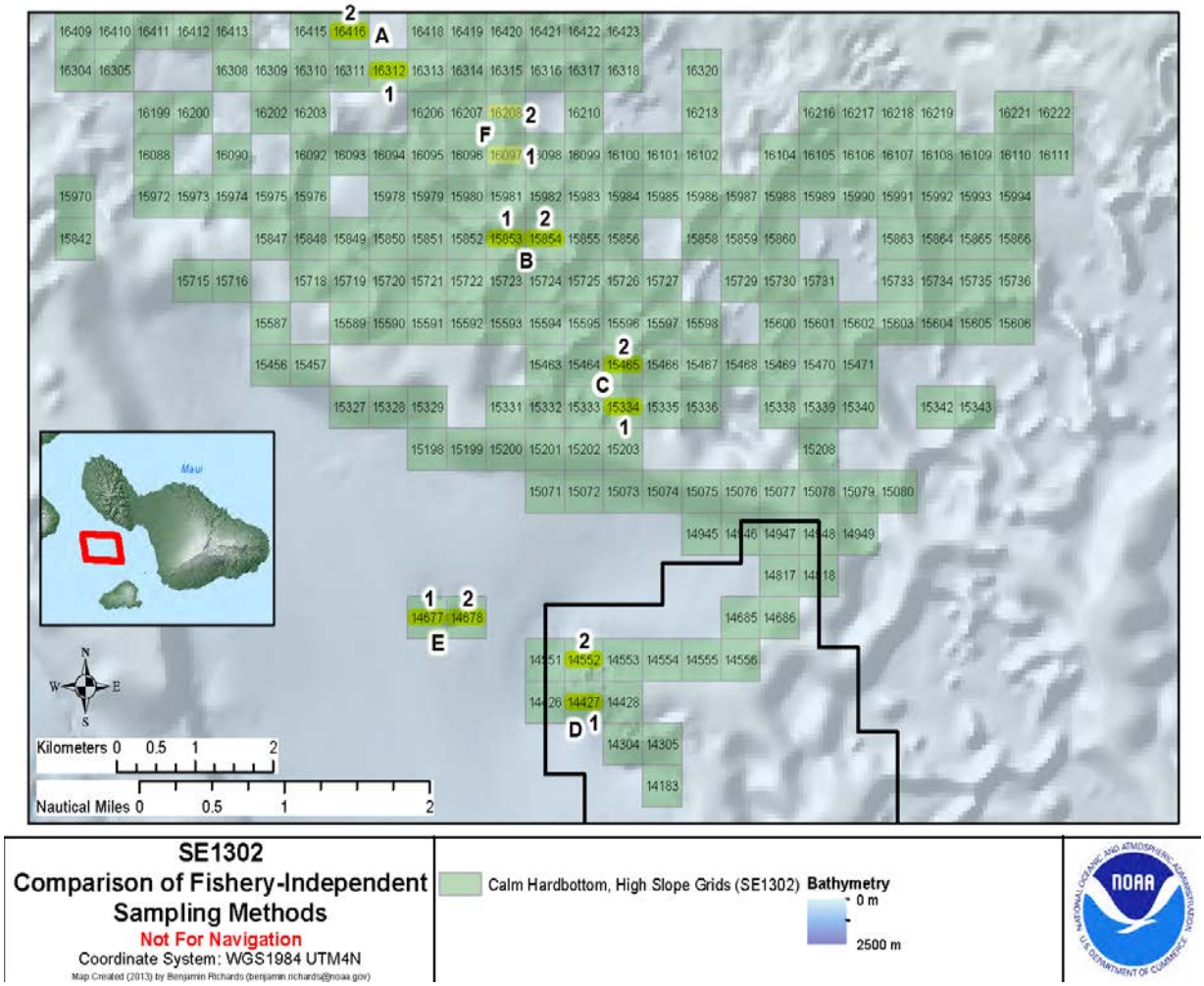


Figure 2. Schematic of *Sette* trackline during acoustic surveys of 500 m × 500 m grids showing 6 passes. Number sequence 1-12 denotes ordering of waypoints for clarity.

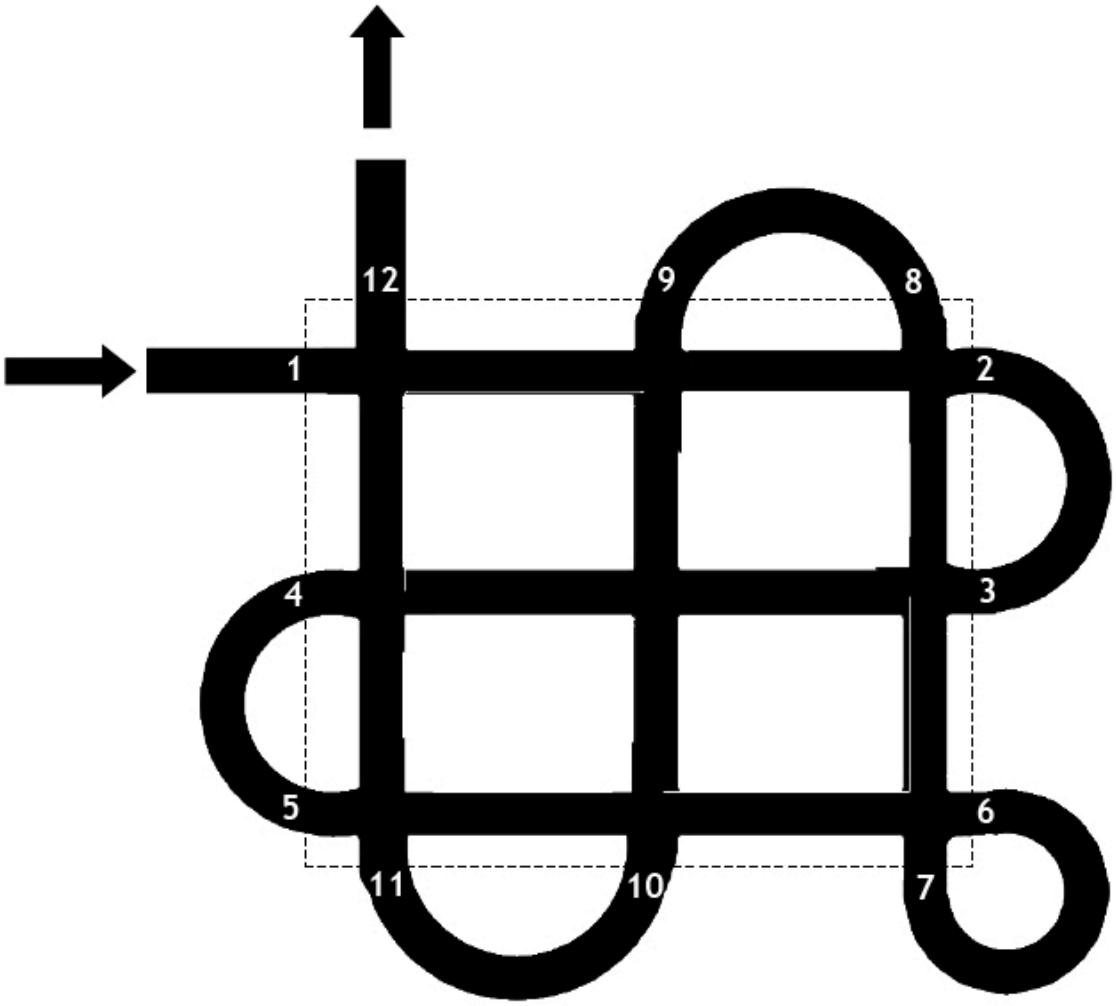
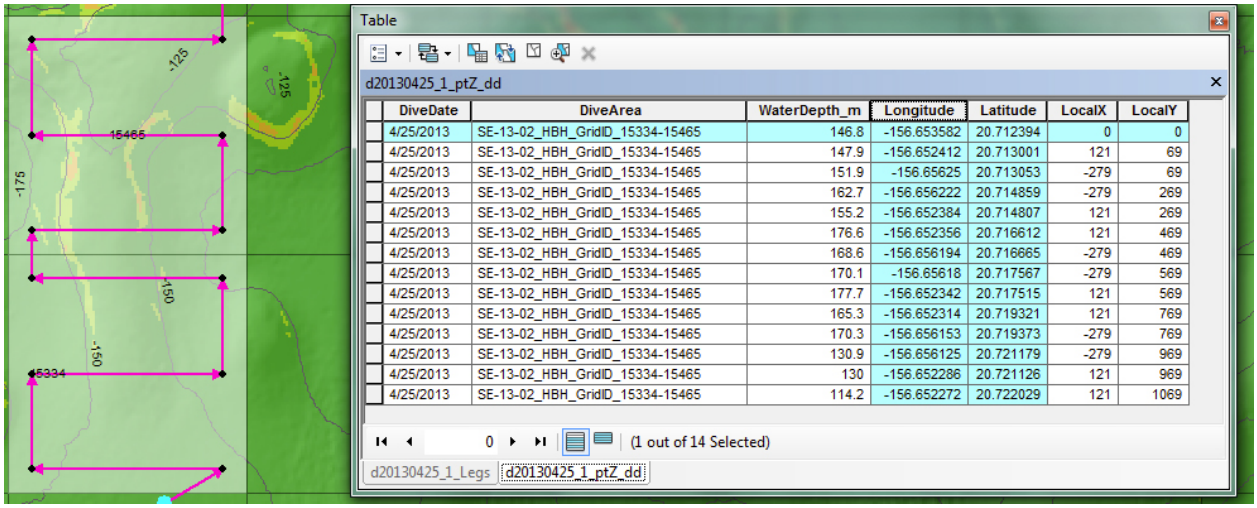


Figure 3. Example trackline of AUV survey of grids C1 and C2.



DiveDate	DiveArea	WaterDepth_m	Longitude	Latitude	LocalX	LocalY
4/25/2013	SE-13-02_HBH_GridID_15334-15465	146.8	-156.653582	20.712394	0	0
4/25/2013	SE-13-02_HBH_GridID_15334-15465	147.9	-156.652412	20.713001	121	69
4/25/2013	SE-13-02_HBH_GridID_15334-15465	151.9	-156.65625	20.713053	-279	69
4/25/2013	SE-13-02_HBH_GridID_15334-15465	162.7	-156.656222	20.714859	-279	269
4/25/2013	SE-13-02_HBH_GridID_15334-15465	155.2	-156.652384	20.714807	121	269
4/25/2013	SE-13-02_HBH_GridID_15334-15465	176.6	-156.652356	20.716612	121	469
4/25/2013	SE-13-02_HBH_GridID_15334-15465	168.6	-156.656194	20.716665	-279	469
4/25/2013	SE-13-02_HBH_GridID_15334-15465	170.1	-156.65618	20.717567	-279	569
4/25/2013	SE-13-02_HBH_GridID_15334-15465	177.7	-156.652342	20.717515	121	569
4/25/2013	SE-13-02_HBH_GridID_15334-15465	165.3	-156.652314	20.719321	121	769
4/25/2013	SE-13-02_HBH_GridID_15334-15465	170.3	-156.656153	20.719373	-279	769
4/25/2013	SE-13-02_HBH_GridID_15334-15465	130.9	-156.656125	20.721179	-279	969
4/25/2013	SE-13-02_HBH_GridID_15334-15465	130	-156.652286	20.721126	121	969
4/25/2013	SE-13-02_HBH_GridID_15334-15465	114.2	-156.652272	20.722029	121	1069

Figure 4. Average catch rate (CPUE) of Deep-7 species of deep-water bottomfish from PIFG partner vessels during project SE-13-02 in each of 12 survey grids.